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a difference—hitherto, apparently, kept dark by mathematicians—between the properties of the roots of a quadratic equation and the properties of quadratic functions of x .

“Professor Shaw makes some strange remarks on page 413. If the collection of all integers does not exist (line 8) it seems hardly necessary to refute the proposition that it is possible to correlate the collection of all integers to some other infinite collections.

“It seems rather unsportsmanlike to rely upon people’s short memories and call Poincaré’s attacks on logistic successful. Might it not be well to remind people of the conclusions to which M. Couturat came at the end of his article in *The Monist* for October, 1912: ‘Admitting the principles and primitive ideas of the logisticians, M. Poincaré has maintained that, setting out from these data, they cannot build up mathematics without another postulate—an appeal to intuition or a synthetic *a priori* judgment; and he has thought that he has discovered in their *logical* construction certain paralogsisms (beggings of the question or vicious circles). I believe that I can conclude from the above discussion that not one of these theses is proved, and that, in particular, the logisticians have not committed any of the logical errors that are so lightly imputed to them.’”

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THE CAL-DIF-FLUK SAGA.

EDITORIAL INTRODUCTION.

Mr. J. M. Child has given, in the following “Saga,” an amusing description of the results he has arrived at in his book on Barrow, just published in the series of “Open Court Classics.” The closing lines represent the opinion he has formed from a consideration of the manuscripts of Leibniz, an annotated translation of which has been appearing in current numbers of *The Monist*, beginning with October, 1916, and continued in the April number and the present one.

The saga evidently refers to the question of the invention of the infinitesimal calculus. Isa-Roba is Barrow, Isa-Tonu is Newton, Zin-Bli is Leibniz, while Cavalieri is mentioned under the name of Ler-a-Cav. Gen-Tan-Agg stands for Barrow’s *Gen*-eral method of *Tan*-gents and of *Agg*-regates; while Shun-Fluk and Cal-Dif ob-

viously refer to the methods of Newton and Leibniz. Batnac is the ordinary abbreviation of the Latin for Cambridge, Cantab., with its letters reversed; and the allusion in the next line is to Barnwell Pool, where it is stated that an undergraduate whose boat had overturned was saved from drowning, but died soon afterward from blood-poisoning! Terangel is a transformation of Angleterre, i. e., England. Ris-Pah is Paris, where Leibniz lived at the time of the invention of the calculus.

In the second stanza, the allusions to "burning midnight oil," the quill pen, incandescent gas mantle, and the electric light are all fairly obvious; while the Swan may be taken to refer to a well-known make of fountain pen. Stanza 5 refers to the publication of a book. The archery in the first method of training alludes to the ancient definitions of a tangent and a normal to a curve; and the sword-play recalls *Euc.* I, 10 and *Euc.* I, 1, while the allusions in the second are easily referred to the method of indivisibles.

In Stanza 9, the dagger refers to the differential triangle, which Barrow only included in the first edition of his work on the advice of Newton; the knobs on the hand-grip refer to Newton's "dot" notation.

The two weapons of Zin-Bli are the signs invented by him for differentiation and integration. Lastly, Li-Nu-Ber is John Bernoulli, who stated that Leibniz got the whole of his fundamental ideas from Barrow, whereas Leibniz himself denied any indebtedness to Barrow.

THE CAL-DIF-FLUK SAGA.¹

1. Saga of sons of a Goddess, of Thought and Learning the fountain,
(Haply in that which I sing, a real historical meaning,
Wrapped in a fanciful garb, and oddly disguised as a saga,
Those who are skilled in lore, and erudite more than their fellows,
Knowing the facts of the case, if they diligently seek may discover.)
Dwelt She, She dwells upon Earth, and henceforth for ever and ever
Dwell so She will among mortals. 'Tis thus decreed by the All-Wise.

2. Oil from the Midnight Lamp the sacrifice burned on her altars,
Plumes from the wing of the Goose her now peculiar token;
Not so at first was it thus, and not in the times that are coming

¹ From a manuscript found in 1916 A.D., while searching an ancient tumulus or "barrow," and made out from the original by J. M. Child.

Will it be Oil and Plume; I see with the eye of the seer
 Wondrous visions of Light, enwrapped in a Mantle resplendent,
 Torn from the heart of a stone, the essential soul of the Sun-god
 Prisoned for ages therein; and globes of crystal translucent
 Glowing with filaments bright kept hot by the Spirit of Lightning,
 Swan of the Golden Beak instead of the Goose for her token.

3. Sent upon Earth to dwell with mortals by will of the All-Wise,
 Children divine to bear to those who Her fancy might capture.
 Ardent and long was the wooing, both strong and patient the lover,
 Ere he received his reward, or ere She presented him offspring.
 Else as a mark of Her love to him She had chosen to honor,—
 Chosen for womanly whim, for some unaccountable reason
 Honored above all else, who never had courted her favor—
 Sent She on lighting wings the soul of Her heart, Inspiration.

4. Children of fathers of Earth, but endowed with the life of the
 Mother,
 Destined as Heroes to wage perpetual warfare on all things
 Troubling the minds of men desiring to widen the limits
 Set on the realm of We-Know, by the race of the children gigantic,
 Issue of Never-Before out of We-Never-Heard-of-the-Method.
 Children begotten from Her are known by the names of their fathers,
 More by the deeds of the sons are the fathers so held up to honor;
 Accurate records are kept; thus long through the ages that follow,
 Known by the deeds of the sons are the fathers so held in remem-
 brance.

Rightly was this the Law, for responsible he for the training,
 Fitting the son for the fight for freedom and fuller perception.

5. Till 'twas such time as was meet, the custom obtained that in
 secret

(Jealous that others might see not fully developed the power
 Promising greatness to come), this fatherly training continued
 Day after day for an eon; until with a flourish of trumpets,
 Front of the eyes of all, tattooed with the symbols of Learning,
 Clad in a mantle of calf-skin, bearing on back and on bosom
 Plainly for all to observe, in resplendent gold letters, his title,
 Son of the Goddess of Thought, was he set as a champion of
 Knowledge.

6. The methods of training were two, at least only two were accounted.

Oldest and best known of all was the method derived from the Ancients,

Cumbrous, exhaustive and long ; horizontal and parallel bar work, Drawing of cord of the bow, and the rings were considered essential ; Accurate hand and eye were developed by shooting an arrow, Grazing the cheek of a figure, or forth from it standing erected ; Cleaving a bar into twain, so each part as to balance the other (Nought but two measuring swings ere the cut was delivered allowed him).

Such like in days of old had fitted the Heroes for battle.

Founded on this was the second, but strangely unlike it in practice ; Suppleness rather than strength was the object and creed of the trainer.

Straight-edged still was the sword ; with it blocks were sliced into shavings,

Shavings were sliced into threads, and threads were chopped into pieces,

Parts of ineffable smallness, divisible reckoned no further.

Masonry part of the course, in which arches with bricks were fashioned,

Leaving the corners undressed ; as the pupil advanced in his training, Smaller and smaller the bricks, indivisible finally counted.

Specially fitted for Heroes, prepared for attack on the giant Clans of A-Re-A and Vol-Yum, the brood of Cur-Va-Rum and Mez-zur.

Failed if the fatherly training, the Goddess in sorrowful anger Took from the child his soul, the gift which at birth She had given, Worthier father to bless, if ever another such won Her.

7. Once in the days now gone, there lived on the banks of the Batnac, Renowned for its smells and its mud, where pollution enters at Well-Barn

(Truly not then was this fame, nor yet at the time of this writing

Thus had it won a repute, 'tis a prophecy sure that I utter),

Land of Terangel within, a mortal yclept Isa-Roba.

Many and varied his loves, his fickleness surely a drawback ;

Truly a wonder it was that the Goddess e'er let him approach Her.

Bare She however a son, Isa-Roba undoubted the father,

Fair both in face and in form, a divine conception befitting ;

Ne'er such a babe before was born with so splendid a future ;
Seemed that the soul of his Mother had enter'd the Child at his
birth-time :

Best that She had to give, best that She can give for all time,
Gave She this son of Her heart ; Gen-Tan-Agg Isa-Roba did name it.

8. Trained he the boy in a manner that savored of that of the An-
cients,

Discipline rigorous keeping, yet toned with a method that fore-time
Ler-A-Cav brought to perfection, a mingling of first and of second
Systems of training recounted ; however 'twas foredoomed to failure.

9. Hercules never so strong as the youth Gen-Tan-Agg, no, nor
Samson.

Armed with his two-handed weapon he met many giants in combat ;
Numerous clans he defeated, by slaying their general doughty.
Nevertheless were his muscles too stiffened by reason of rigor,
Due to the manner in which Isa-Roba conducted his training.
Love for the two-handed broadsword, with which Isa-Roba had
armed him,

Made him neglect the superior weapon that hung at his waist-belt,
Sharper by far than the sword-blade, a steel of superior temper ;
Seems Gen-Tan-Agg only used it preparing the shafts of his arrows ;
Nigh came to leave it at home as he set out upon his first journey,
Girding it on at the last, not perceiving in it that a weapon
Ready to hand he had got against which no armor of mortals
Could for a moment prevail ; for piercing the joints of the harness,
Off'ring no passage to sword-blade, it reached his opponent's main
vitals ;

Forced him to give up his treasure, the secret protected for ages.

10. Happened it thus that a Hero, high-blessed by the Goddess his
Mother,

Spoiled by the weapon mistaken his anxious sire recommended,
Fame and renown and great honor did miss for ever and all time,
Losing the chance that was offered, a name and a high reputation.
Lastly, by father discarded (who fickle returned to a first love),
Languished and nigh came to perish, unhonored, unsung and neg-
lected.

11. Some of the records of giants the youth Gen-Tan-Agg had de-
feated

Chanced Isa-Roba, however, had told to a friend Isa-Tonu;
 Agile by nature, the latter immediate saw that the dagger,
 Superior far to the broadsword, was a weapon of magical value;
 ('Twas Isa-Tonu's advising that just at the very last moment
 Caused Isa-Roba to add to his offspring's armor the dagger).
 Pity, perhaps, for the youth, or a covetous eye for the poignard,
 Caused Isa-Tonu to take neath his fostering care the young stripling,
 Freeing his father from trouble, unhampered to follow his fancy.
 Thus Isa-Roba the story departs from, unhonored for all time;
 Save and if only in future, this tomb may be opened by some one
 Trying to find out the truth of the Hero's father and birthtime.
 Under the fostering care of a trainer less hide-bound by nature,
 Slowly at first, then apace, did the Hero recover his power.
 Changed was his armor, the sword altogether replaced by the dagger,
 Changed was the dagger in form, for a knob, sometimes two, on the
 hand-grip
 Gave it a far better balance. Obsessed by his special requirements,
 Secretly long Isa-Tonu did bind Gen-Tan-Agg to his service.
 Later ungratefully hiding the name of the Hero who served him,
 Swearing that all had been done by his own bastard offspring, young
 Shun-Fluk.

12. Thus once again was the Hero discarded and left for to languish,
 Shun-Fluk attaining the fame that should his have been truly and
 rightly.

Nemesis, son of old Equity, sternest of Gods and the justest,
 Saw Isa-Tonu's deception, and straightway the Goddess of Learning
 Sought He and told Her the story. In sorrowful anger the Goddess
 Listened with eyes that flamed at the failure that followed Her off-
 spring,

Due to his father's bad training, and then Isa-Tonu's enslavement;
 Listened and cursed the first, for the other a punishment thought out.

13. "Punishment dreadful and dire!" So she spake, the while Neme-
 sis listened,
 Listened and nodded and smiled, as approved He the plan She sug-
 gested.

"Lives there a mortal in Ris-Pah, who long has courted my favor;
 Often of late have I thought that at last I'd reward his devotion.
 Lacks he but one little thing, only one thing to render him fitting

Trainer of offspring of mine ; but the lack mean I now to forgive him.

Never again could I bear such a child as I bore Isa-Roba ;
 Certain is that ; but immortal the soul that at birth-time I gave him,
 Breath of my life, Inspiration, again, Gen-Tan-Agg expiring,
 Can, if I will it, enlighten the child which I'll offer to Zin-Bli.
 Thus is he called by mortals, an inventor of weapons and symbols.
 One has he fashioned already, in shape like a chopper for fire-wood,
 Straight in the shaft, with a hand-stop to stay it from slipping,
 Circular edge to the axe-blade, to shaft is it fastened by bolt-head ;
 Much like the symbol that mortals set fourth in the lower-case
 system.

This shall he teach my offspring to use to more delicate purpose.
 Binds he his sticks all together with cord made out of the sum-omn ;
 Lurking however in thought is the germ of a better invention,
 Rod with curl at each end, slightly bent, so that clipped round the
 bundle,

Binding the whole into one, he is able to thus grasp it firmly.
 Armed with each of these twain, shall his offspring forth stand as
 a Hero."

Spake She, and Nemesis nodding to all His approval, it was so.

14. Cal-Dif named Zin-Bli the child, and he trained him these weapons to master ;

Speed, at all rates, with the first he created new records completely,
 Nor did he stay at that ; with the second, the brood of the giants,
 Laid he them low in the dust, so that never again should they trouble.
 All that the Goddess had said, so performed She ; the credit of
 Cal-Dif

Famed through the kingdoms of mortals, became a renown for the
 father,

Ne'er to be equalled till Earth is devoid of reasoning mankind.

15. Swelled as to head by renown, though Zin-Bli well knew Inspiration

(Could he forget this?) had wrought in a magical manner the marvel,
 Yet could not bear it for others to know whence the source of his
 wisdom ;

Denied he the source whence it came, Isa-Roba's offspring discarded.
 Nemesis saw what he did, and he stirred up the folk of Terangel,

Shun-Fluk to accuse him of stealing and sending him forth as his
Dif-Cal.

None seemed to have guessed the truth, save a man by the name of
Li-Nu-Ber.

16. Ye who perchance may consider this saga in future far ages,
Know now the truth ye may ; that the soul of the Goddess of Learn-
ing

Entered at first Gen-Tan-Agg, but he languished for lack of good
training ;

Afterwards, renamed Shun-Fluk, he recovered some of his birth-
right ;

Dying, his soul was then given to an ordinary child of a mortal,
Rendering its face and its form like one of divine conception.

17. Accepted as such by all, till the day that this saga's discovered,
Haply e'en then, for foretell I that Cal-Dif

Unfortunately, the manuscript, which consists of another couple
of sheets that were outermost in the roll, here becomes indecipher-
able through being destroyed by damp ; it would have been inter-
esting, and useful in the light of judging of the truth of the facts
given, to have verified how far the prophecies were fulfilled by
events since the time at which they were written down and the
manuscript hidden in this old burial-mound.

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NOTES ON DE MORGAN'S BUDGET OF PARADOXES.

In a work requiring the large amount of reading involved in
editing a book like the *Budget of Paradoxes*, and particularly in the
condensing of the results to the proper proportions for footnotes
to aid the reader, it was, of course, inevitable that a certain number
of inaccuracies would occur. It is also evident that many more
notes might profitably have been added to elucidate the meaning
of the text, or to correct the original where this would be warranted.

De Morgan was a careless writer and many of his errors are
mentioned in the footnotes ; but numerous others exist, some of
which are patent to any reader and others of which might profitably